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EFFECTS OF COMPUTER-ASSISTED INSTRUCTIONAL PACKAGE (CAIP) ON JUNIOR SECONDARY SCHOOL STUDENTS' PERFORMANCE IN BASIC SCIENCE IN ONDO, NIGERIA

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Abstract:
The study investigated the effects of Computer-Assisted Instructional Package (CAIP) on junior secondary school students' performance in Basic Science in Ondo West Local Government Area of Ondo State, Nigeria. The study adopted pretest – protest control group in quasi experimental design. Two intact classes comprised of forty (40) students (20 males and 20 females) in junior secondary school II took part in the study. The Basic Science Performance Test (BASPET) was used to collect pre-test and post-test scores of students in the experimental and control groups. The internal consistency of BASPET was 0.79 using Kuder-Richardson formula 21. Descriptive statistics such as mean and standard deviation was used to answer the research questions raised in the study, while the inferential statistics; t-test was used to test the formulated hypotheses at 0.05 level of significance. The results revealed that, students taught with Computer-Assisted Instructional Package (CAIP) performed significantly better than those taught with Conventional Method (CMT) at the post test stage. Based on the findings of the study, it was concluded that, CAIP facilitated greater learning among students. It was therefore recommended that, secondary school science students should be taught using CAIP and also, teachers should be trained to be computer literate by attending seminars, workshops involving computer training to enhance efficient performance.

Keywords: computer-assisted instructional package, students' performance, basic science

1. Introduction

Science has been described in various ways by different authors. Adesina (1987) defined science as an attitude towards the acquisition of knowledge, an attitude that emphasizes keener observation of one's surroundings than usual. George (2000) also

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defined science as the exploration of the material universe for the purpose of seeking orderly explanations that must be testable. Science assists in producing the professionals that help in the sustenance and development of the society. Such skilled professionals include doctors, engineers, agriculturists, bio-chemists, and pharmacists. The projection captured in these definitions justifies the inclusion of science subjects in the secondary school curriculum. At the junior secondary school level, all areas of science are integrated into Basic Science which occupies a unique position in the school curriculum.

Basic Science is central to many science related courses such as medicine, pharmacy, agriculture, nursing, biochemistry and engineering. According to the core curriculum for Science, the essence of Basic Science course is to introduce scientific concepts to pupils at the early level of education. It is obvious that no student intending to study Physics, Chemistry, Biology, Agricultural Science and Physical and Health Education can do without Basic Science. Despite the importance and popularity of Basic Science among Nigerian students, performance at junior secondary school level has been poor (Ahmed, 2008). To buttress this, a statistics released by the Ondo State Ministry of Education (2014) in the year 2012, 2013 and 2014 showed that, 40.5%, 17.4% and 31.5% respectively failed Basic Science as a subject.

Some factors have been noted in the past as causes of this problem. For instance, as noted by Okoli (1995), classrooms in Nigeria have been typified by traditional patterns of teaching and learning which have remained unchanged and has been having negative effect on students' performance. In spite of the inefficiency, Karon and Bryne (2005) observed that in Nigeria, traditional method of teaching, traditional teaching materials (teachers' textbooks and chalkboards) were no longer adequate to cope with the amount and type of skills and competences expected of students. Besides Okeke (2006) identified poor teaching methods as a major factor affecting poor performance of students. Bankolere (2007) noted that, these problems emanated as a result of a lot of the problems facing the effective teaching and learning at all levels of Nigerian educational institution.

Other factors responsible for low performance of students in Basic Science include; poor quality of science teachers, overcrowded classrooms and lack of suitable/adequate science equipment. Some factors have been noted in the past as causes of this problem. For instance, as noted by Okoli (1995), classrooms in Nigeria have been typified by traditional patterns of teaching and learning which have remained unchanged and has been having negative effect on students' performance. In spite of the inefficiency, Karon and Bryne (2005) observed that in Nigeria, traditional method of teaching, traditional teaching materials (teachers' textbooks and chalkboards) were no longer adequate to cope with the amount and type of skills and competences expected of students. Besides Okeke (2006) identified poor teaching methods as a major factor affecting poor performance of students. Bankolere (2007) noted that, these problems emanated as a result of problems facing the effective teaching and learning at all levels of Nigerian educational institution.

Gay and Sakamoto (2007) observed that, computer is now relevant in all professions. According to them, computer assist in learning in the field of education; on-line banking and investing in finance; international relations; maintenance of records and management of hospitals; designing of pages and work content by publishers and running of online allocation system to help people travel more quickly and safely.

Generally, teachers use computers for instruction. Computer is not just a teaching tool like chalkboard or textbook. It is rather a device which provides students with interactive involvement with instructional materials. The use of computer as a learning medium is referred to as Computer Assisted Instruction (CAI). In CAI, the computer acts as a tutor, teaching new skills or concepts or providing practice for learners. As the name implies, the basic interaction in CAI occurs between the learner and the computer. CAI has been found to enhance students' performance in counselling education than the conventional instructional method (Kaper, Robinson & Casado-Kehoe, 2005). In addition, students learn instructional contents faster with CAI than with the conventional instruction alone and also, they retain what they have learned better with CAI than with the conventional instruction (Tabassum, 2004).

Conventional method according to Abimbade (1999) is also known as face-to-face method or lecture method. It is an organized verbal presentation of a subject-matter where the presenter dominates the exercise for long period with or without the students' involvement. The teacher controls the instructional process, the content is delivered to the entire class and the teacher tends to emphasize factual knowledge. In other words, the teacher delivers the lecture content and the students listen to the lecture. Thus, the learning mode tends to be passive and the learners play little part in their learning process (Orlich, Harder, Callahan, Trevisan & Brown, 2003). By this method, the teacher organizes resources, prepares outline and presents the lecture, while the students are made to listen. Occasionally, teachers may use illustrative materials. Where it is used, the teacher should clarify the terms used and explain every new concept. It has limited value to achieve behavioural and attitudinal changes. Lecture is one-way communication.

From this background, various studies had revealed how CAI and conventional method of teaching have benefitted different subjects such as chemistry, biology, mathematics, geography and physics. It is against this background that the effect of Computer-Assisted Instructional Package and conventional method on teaching and learning of Basic Science were investigated in this study.

The search for improvement and effectiveness in teaching and learning of Basic Science at the junior secondary school level by concerned individuals, educationists and researchers have so far not yielded the optimum results as the students' performance and interest in this subject are still reported to be very low. The consistent poor performance has been attributed to the teachers' use of inappropriate instructional strategies (Ahmed, 2008). Learner-centred instructional strategy such as Computer-Assisted Instructional Package has been successfully used to improve performance in different subjects at the senior secondary school level. However, a research is yet to

ascertain if this strategy could be effectively utilized to enhance the teaching and learning of Basic Science. This study is therefore, designed to investigate the effects of Computer-Assisted Instructional Package on students' performance in Basic Science in Nigerian junior secondary schools.

1.1 Purpose of the Study

The main purpose of this study is to investigate the effects of Computer-Assisted Instructional Package on students' performance in Basic Science. Specifically, the objective of the study is to find out the relative effectiveness of Computer-Assisted Instructional Package and conventional method on students' academic performance in Basic Science.

1.2 Research Questions

The following research questions were answered in the course of this study.

1. Is there any difference in students' academic performance in Basic Science in the two groups before treatment?
2. Is there any difference in students' academic performance in Basic Science when exposed to Computer-Assisted Instructional Package (CAIP) and Conventional Method of Teaching (CMT)?

1.3 Hypotheses

The following hypotheses were tested at 0.05 level of significance.

Ho_1: There is no significant difference in the pre- test mean scores of students taught Basic Science with CAIP and those taught with CMT

Ho_2: There is no significant difference in the post test mean scores of the students taught Basic Science using CAIP and those taught using CMT.

2. Methodology

This study employed pretest - posttest control group in quasi experimental research design. The two groups comprised the Computer-Assisted Instructional Package (CAIP) (treatment) and conventional method (control) groups. The target population for the study consisted of all JSS 2 students in the thirty one (31) junior secondary schools in Ondo West Local Government Area of Ondo State. Two(2) out of the thirty one public junior secondary schools in staked local government area were purposively sampled out of the study based on the criteria of having well equipped computer laboratory and qualified/experienced basic science teacher. The sample is an intact one. The experimental group was taught the selected topics (Water Pollution, Air pollution, Soil pollution and Drug Use/Abuse) in Basic Science with CAIP while the control group was taught with conventional method. Basic Science Performance Test (BASPET) was the research instrument used, validated and found to be reliable with 0.79 reliability coefficient using Kuder-Richardson formula 21. The instrument was administered to the

sample to generate the pre-test before treatment and post test data after the treatment which lasted for four weeks.

3. Results

3.1 Answers to Research Questions

Research Question 1: Is there any difference in students' academic performance in Basic Science in the two groups before treatment?

Table 1: Analysis of the Students' Mean Scores before Treatment

	N	Pre Test	
		$\bar{x}$	SD
CAIP	20	7.55	2.724
CMT	20	7.95	2.114

As shown in Table 1, the pre-test mean scores for the group of students taught Basic Science using Computer Assisted Instructional Package (CAIP) was 7.55, while the mean scores for the group taught Basic Science using Conventional Method of Teaching (CMT) was 7.95. It was therefore concluded that performance of the Conventional Method of Teaching group was higher than Computer-Assisted Instructional Package group.

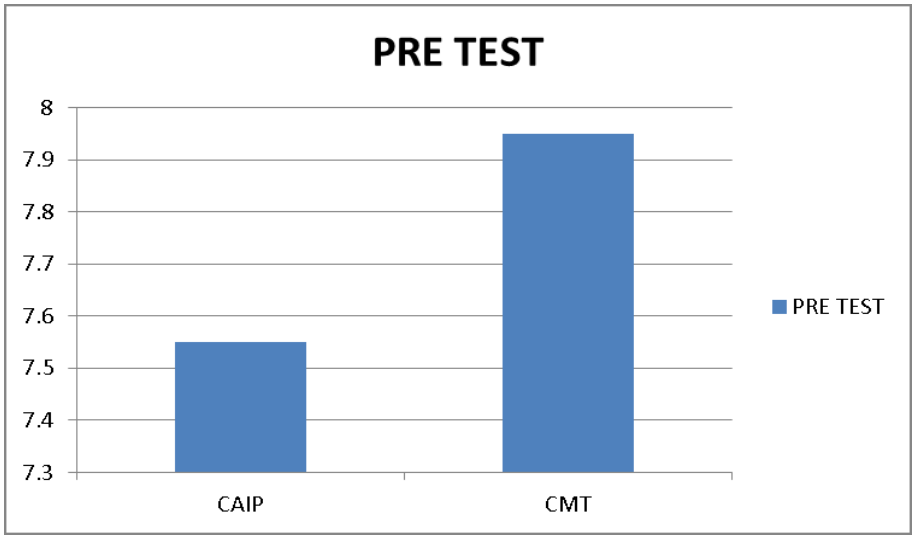

Figure 1: A bar chart showing the pre-test mean scores of students before treatment

Figure 1 above shows the bar chart of the two groups mean scores and their differences. It was noted that the mean score of CAIP group is lower than that of the CMT group.

Research Question 2: Is there any difference in students' academic performance in Basic Science when exposed to Computer Assisted Instructional Package (CAIP) and Conventional Method of Teaching (CMT) after treatment?

Table 2: Analysis of the Students' Mean Scores After Treatment

	N	Post Test	
		$\bar{x}$	SD
CAIP	20	15.85	2.560
CMT	20	13.45	1.638

Table 2 shows that the post-test mean scores for the groups of students taught Basic Science using CAIP was 15.85 while that of the group taught using CMT was 13.45. This indicates that, there is a difference in the performance of the two groups after treatment. The mean score of the group taught Basic Science using CAIP is higher than the mean score of the group taught Basic Science using CMT.

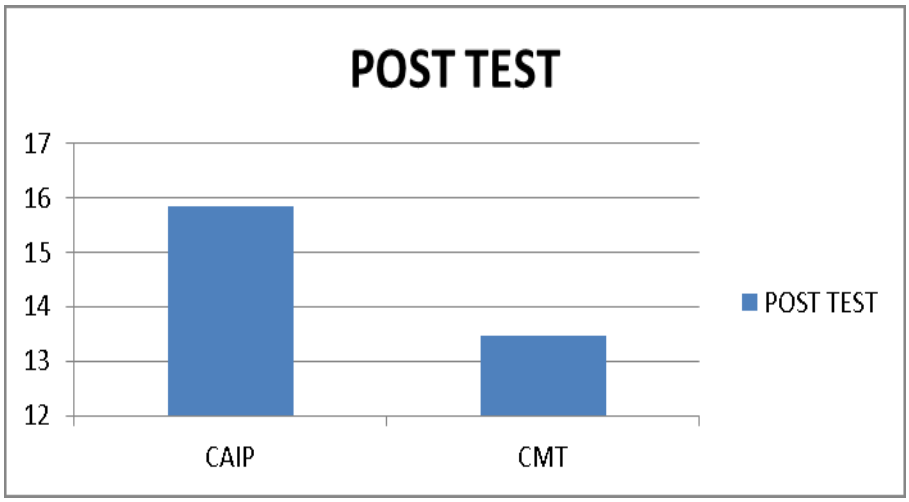

Figure 2: A bar chart showing the post-test mean scores of students after treatment

Figure 2 shows the bar chart of the two groups mean scores after treatment. The mean score of CAIP group was higher than the CMT group.

3.2 Hypotheses Testing

Hypothesis 1: There is no significant difference in the pre-test mean scores of students taught Basic Science with CAIP and those taught with CMT

Table 3: t-test analysis of the pre-test mean scores of students taught with CAIP and CMT

Group	N	$\bar{x}$	SD	df	t-cal	t-critical
CAIP	20	7.95	2.114	38	0.518	2.04
CMT	20	7.55	2.724			

$P \leq 0.05$

Table 3 shows that, t-cal value (0.518) is less than t-tab (2.04) at 0.05 level of significance. Since the t-table value is greater than the t-calculated value, this shows that there is no significant difference in the pre-test mean scores of the group taught using CAIP and those taught using CMT, hence the hypothesis was not rejected.

Hypothesis 2: There is no significant difference in the post test mean scores of the students taught Basic Science using CAIP and those taught using CMT.

Table 4: t-test analysis of the post-test mean scores of students taught with CAIP and CMT

Group	N	$\bar{x}$	SD	Df	t-cal	t-critical
CAIP	20	15.85	1.638	38	11.378	2.04
CMT	20	13.45	2.560			

$P \leq 0.05$

Table 4 reveals that, the mean and standard deviation scores for the group of students taught Basic Science using CAIP were 15.85 and 1.638 respectively, while the mean and standard deviation scores for those taught with CMT were 13.45 and 2.560 respectively. The table also indicates that, the t-cal. value is 11.378 while the t-table value at 0.05 level of significance is 2.04. Since the t-cal value (11.378) is greater than the t-table value, the hypothesis was therefore rejected. This implies that, there is a significant difference between the post-test mean scores of the group taught Basic Science using CAIP and those taught using CMT. This result shows that, the group taught using CAIP performed significantly better than those taught using CMT.

4. Discussion of Findings

The findings of this study showed that, CAIP produced significant effect at the post-test performance of students in Basic Science and that CAIP group responds to treatment when exposed to the method of teaching. It is also noted that, the CAIP group performed significantly higher than the CMT group. This implies that, CAIP is more effective than CMT. These findings was in consonance with works of Okoro and Etukudo (2001), Egunjobi (2002) and Karper, Robinson and Casado (2005) and Paul & Babaworo (2006), who found that, CAI was effective in enhancing students' performance in subjects such as Chemistry, Geography, Counselling Education and Technical Education respectively. However, the result was contrary to the findings of Onasanya, Daramola and Asuquo (2006) who found that, there was no significant difference in the performance of students of Introductory Technology who were exposed to individualized CAI package and those taught using conventional method of teaching.

The implication of this is that, CAIP is good for teaching. Even though some authors such as Morgil (2004), Rasaga (2008) and Hussain (2011) have denigrated the CMT and claimed that it is not an effective teaching method to achieve success in science subjects like; Basic Science, it is important to state that CMT has for long not been well presented or use with necessary teaching tools like model and other teaching aids. Apart from this, the rush toward computer based teaching resources is attitudinal and love of materials in vogue. CMT would continually be relevant to teaching and learning if concerted efforts are taken to ensure that it is well articulated, planned and presented so that it can help to boost learning outcomes. However, conventional

method should be well articulated, planned and presented so that it can help to boost learning outcomes.

4.1 Summary

This study investigated the effects of Computer Assisted Instructional Package (CAIP) and Conventional Method of Teaching (CMT) on students' academic performance in Basic Science. The study employed a quasi-experimental design of non-randomize pre-test, post-test and control group type with intact classes using CAIP as experimental and CMT as control group. The population consisted of all JSS2 Basic Science students in Ondo West Local Government Area of Ondo State randomly selected for the investigation. A purposive sampling technique was used to select JSS2 from two schools in the selected local government. In each of the two groups, 10 males and 10 females students were purposively sampled from JSS2 class. The sample was therefore 40(forty) students. Participants from School A served as experimental group, while those from School B served as control group. The choice of JSS2 students was based on the agreement that JSS3 students may be distracted by the junior secondary school certificate examination while JSS1 students may exhibit low level of computer literacy.

The classes were randomly assigned to experimental and control groups. Basic Science Performance Test (BASPET) was the instrument used. The instrument was administered to the sample to generate the pre-test before treatment and post-test data after the treatment which lasted for six weeks. Data collected were analysed using descriptive and inferential statistics (t-test) to answer two research questions and to test the two corresponding hypotheses formulated for the study respectively. Hypotheses were tested at 0.05 level of significance.

The study showed that, there was a significant difference between the post-test mean scores of the group taught Basic Science using CAIP and those taught using CMT. It showed further that, the group taught using CAIP performed significantly better than those taught using CMT.

5. Conclusion

From the findings of this study, the following conclusions were drawn: Students' performance was enhanced when exposed to both CAIP. The study found that, the performance of students exposed to CAIP improved after the treatment. This indicates that CAIP is effective in teaching Basic Science at the junior school level. However, students taught Basic Science using CAIP performed significantly better than the CMT.

5.1 Recommendations

Based on the findings in this study, the following recommendations were made:

1. teachers should be encouraged to use CAIP to deliver lectures;

2. use of conventional method should still be fruitfully used in teaching but instructional materials should be utilized to aid students learning but additional use of CAIP alongside CMT will aid students learning;
3. government should endeavour to provide necessary Information and Communication Technology (ICT) and other resources that could enhance learning; and
4. teachers should acquire more skills on the use of computer, so as to train students effectively and thereby encourage the use of CAIP in schools.

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